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## COMPLETE STEPPER MOTOR SYSTEMS

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***MICROCON***<sup>®</sup>

2001

## PRODUCT OVERVIEW



### Stepper Indexer/Drive Units - CD Series

- programmable stepper motor controller
- small programmable logic controller
- microstepping for smooth operation

### Microstepping Stepper Drives - SD Series

- Step and Direction inputs
- microstepping for smooth operation

### Stepper Motors

- holding torque from 0,15 Nm to 40 Nm
- 200 full steps per revolution  
(electronic microstepping is available)

### Worm Gear Reducers

### Huco Flexible Couplers

- sliding disc type (OLDHAM),  
multi-helix beam type (MULTI-BEAM),  
bellows type (FLEX-B),  
membrane type (FLEX-M), etc.
- peak torques up to 140 Nm
- large range of shaft bore diameters

### Kerk Lead Screw Assemblies

### Kerk ScrewRails

- patented backlash compensation  
(Axial Take-Up Mechanism)

### Bosch Rexroth Linear Motion Slides

Compact modules

Linear motion slides with supporting shafts



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## **COMPLETE MOTION CONTROL SYSTEMS IN ONE SHIPMENT**

Microcon has developed and manufactured stepper motor control electronics since 1991.

Besides programmable stepper motor control the broad product line includes also stepper motors, flexible couplers, lead screw assemblies, linear motion systems and worm gear reducers.

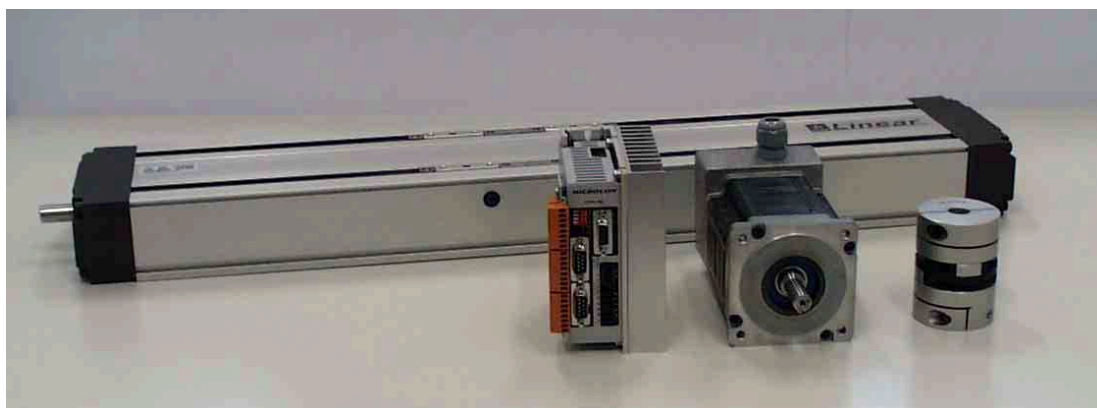
Microcon is the authorized distributor for the Czech Republic and the Slovak Republic of below mentioned companies:

PACIFIC SCIENTIFIC (USA) - stepper and servo motor systems

HUCO ENGINEERING (GB) - flexible couplers and other transmission components

KERK MOTION PRODUCTS (USA) - lead screw assemblies and light load linear systems

Furthermore the wide product range includes BOSCH REXROTH linear motion systems and TOS Znojmo worm gear reducers.



Standard products mentioned in this catalogue are held on the Microcon stock in Prague.

## PROGRAMMABLE STEPPER INDEXER/DRIVE UNITS - CD SERIES BOARDS AND MODULES



### General Description

Programmable stepper boards and modules with RS232 indexer (the M1486 controller - precision motion control with other programmable machine control functions such as I/O on a single chip) and bipolar microstepping drive.

The CD series units are equipped with the M1486E1 controller (2000 bits EEPROM command memory) in a basic version.

All commands are automatically executed on power-up without battery back-up. Most of applications use the stand alone mode, the internal memory enables pre-programmed move sequences to be repeated off line. Units equipped with the M1486A or M1486B controller (RAM command memory) are also available for on-line control applications without battery back-up.

The CD series boards and modules provide higher step resolution that virtually eliminates low speed resonance and step-to-step oscillation in stepper motor systems and provide simple and flexible stepper motor control.

### Where To Use

Stepper motor applications, the CD series boards and modules for complete motion control systems.

### Max. Motor Current Amplitude

2 A - 14 A

### Supply Voltage

12 V<sub>DC</sub> - 140 V<sub>DC</sub>

# STEPPER INDEXER/DRIVE BOARDS

## CD Series Boards

**Programmable stepper boards with RS232 indexer and bipolar microstepping drive.**

### ◆ Driver

- Bipolar chopper drive for two-phase stepper motors
- Programmable microstepping for smooth operation - up to four microsteps per full step
- Current reduction during rest to reduce motor heating
- Drive disable possibility by means of user input as well as by indexer command
- Single unregulated supply voltage

The stabilized power supply is not necessary due to the motor current chopper regulation. Only a transformer and a diode bridge are sufficient. An external power supply capacitor can be omitted due to the electrolytic capacitor 4 000 µF (5 000 µF) on the board.

Torque speed characteristics of the CD series boards with stepper motors - see page 23, 24.

### ◆ Indexer

The indexer is equipped with the M1486 controller which provides simple and flexible stepper motor control.

The M1486 controller includes:

- **Programmable stepper motor controller**  
(distance, velocity, acceleration, microstepping)
- **Small programmable logic controller**  
(inputs/outputs, loops, conditional jumps, dwells)

Complete machine control can be simply executed by using a controller command file. See page 10 and 11 for details about the controller commands - standard ASCII characters. The board can be linked to a PC or any host computer equipped with the RS232 interface. The CD30M and CD40M boards serial port is opto-isolated. Up to 16 units can be controlled from one host computer using a single port for multi-axis control.

### - Stand Alone Mode

After command file is downloaded the board can be used in a stand alone application. In the stand alone mode the internal EEPROM memory enables pre-programmed move sequences to be repeated off line.

### - User Inputs/Outputs

The board provides digital user inputs/outputs which are available to initiate or monitor external events.

### - 5 opto-isolated user inputs

All user inputs are opto-isolated for a high noise immunity. Both anodes and cathodes of optocouplers input diodes are connected to CANNON 15 Pin/F connector. The standard input level is 24 V (7 mA), 5 V optional.

### - 4 user outputs

Open collector outputs (up to 30 V) and auxiliary 24 V (100 mA) output.

Low level output current ..... 100 mA  
24 V source drivers (switchable to 5 V output level) are optional  
- please add A1 appendix to the board name.  
High level output current ..... 40 mA

### - Input and Output Connectors

RS232 serial port input ..... CANNON 9 Pin/M  
RS232 serial port output ..... CANNON 9 Pin/M  
User inputs/outputs ..... CANNON 15 Pin/F  
Stepper motor ..... removable screw terminal - 4 way  
Power supply ..... removable screw terminal - 2 way

### - Applications

The board enables quick solution of applications requirements with flexible changes possibility using modified command file when needed.

## CD20M



### Driver Specifications

Supply voltage ..... **12 to 35 V**  
Motor current amplitude / ph. ... **2 A peak**  
Motor current amplitude in 8 levels from 0,4 to 2 A peak  
Board electrolytic capacitor 4 000 µF  
Suitable stepper motors - holding torque **from 0,15 to 1,2 Nm**

### Dimensions

160x100x30 mm; eurocard-sized board

## CD30M



### Driver Specifications

Supply voltage ..... **12 to 48 V**  
Motor current amplitude / ph. **3,3 A peak**  
Motor current amplitude in 16 levels from 0,4 to 3,3 A peak  
Board electrolytic capacitor 5 000 µF  
Suitable stepper motors - holding torque **from 1,2 to 8,5 Nm**

### Dimensions

160x100x30 mm; eurocard-sized board

## CD40M



### Driver Specifications

Supply voltage ..... **12 to 48 V**  
Motor current amplitude / ph. ... **4 A peak**  
Motor current amplitude in 16 levels from 0,4 to 4 A peak  
Board electrolytic capacitor 5 000 µF  
Suitable stepper motors - holding torque **from 3 to 8,5 Nm**

### Dimensions

160x100x45 mm; eurocard-sized board



## STEPPER INDEXER/DRIVE MODULES

## CD34M

**High performance stepper module with RS232/422 indexer and bipolar microstepping drive.**

The CD34M is suitable for stepper motors with the holding torque from 1,5 Nm to 8,5 Nm.

◆ **Driver**

- Bipolar chopper drive for two-phase stepper motors
- Motor current amplitude up to 3,5 A peak / phase
- Programmable microstepping for smooth operation up to four microsteps per full step
- Current reduction during rest to reduce motor heating
- User selectable motor current amplitude in sixteen levels from 0,4 A to 3,5 A peak
- Drive disable possibility by means of user input as well as by indexer command
- Single unregulated supply voltage between 12 V and 48 V

The stabilized power supply is not necessary due to the motor current chopper regulation. Only a transformer and a diode bridge are sufficient. An external power supply capacitor can be omitted due to the module electrolytic capacitor 5 000 µF.

◆ **Indexer**

The indexer is equipped with the M1486 controller which provides simple and flexible stepper motor control.

The M1486 controller includes:

- **Programmable stepper motor controller**  
(distance, velocity, acceleration, microstepping)
- **Small programmable logic controller**  
(inputs/outputs, loops, conditional jumps, dwells)

Complete machine control can be simply executed by using a controller command file. See page 10 and 11 for details about the controller commands - standard ASCII characters. The module can be linked to a PC or any host computer equipped with the RS232 interface. The module serial port is opto-isolated. Up to 16 modules can be controlled from one host computer using a single port for multi-axis control.

- **Stand Alone Mode**

After command file is downloaded the module can be used in a stand alone application. In the stand alone mode the internal EEPROM memory enables pre-programmed move sequences to be repeated off line.

- **User Inputs/Outputs**

The module provides digital user inputs/outputs which are available to initiate or monitor external events.

- **8 opto-isolated user inputs** - 24 V level (5 V optional)
- **4 user outputs**

- **Applications**

The module enables quick solution of application requirements with flexible changes possibility using modified command file when needed.

- **Module Versions**

**CD34M** - RS232 serial port - basic version

**CD34M-A1** - RS232 serial port, 24 V (5 V opt.) source drivers

**CD34MD (CD34MD-A1)** - RS422 serial port

◆ **Technical Specifications**- **Driver Specifications**

Supply voltage ..... 12 to 48 V  
Motor current amplitude / phase ..... 3,5 A peak

Torque speed characteristics of the CD34M module with stepper motors are identical to the CD30M board characteristics - see page 23, 24; separately on page 24.

- **Indexer Specifications**

See the M1486 controller description on page 10 and 11.

- **User Inputs**

All user inputs are opto-isolated for a high noise immunity. Both anodes and cathodes of optocouplers input diodes are connected to CANNON 15 Pin/F connector.

The standard input level is 24 V (7 mA), 5 V optional.

- **User Outputs**

Open collector outputs (up to 30 V); auxiliary 24 V (100 mA) output, GND and motor moving flag are connected to CANNON 9 Pin/F connector.

Low level output current ..... 100 mA

24 V source drivers (switchable to 5 V output level) are optional - please add A1 appendix to the module name.

High level output current ..... 40 mA

- **Input and Output Connectors**

RS232 (RS422) serial port input ..... CANNON 9 Pin/M

RS232 (RS422) serial port output ..... CANNON 9 Pin/M

User inputs ..... CANNON 15 Pin/F

User outputs ..... CANNON 9 Pin/F

Stepper motor ..... removable screw terminal - 4 way

Power supply ..... removable screw terminal - 2 way

- **Dimensions**

170x130x50 mm; the module contains rails for standard eurocard mounting.

## STEPPER INDEXER/DRIVE MODULES

### CD6410M

**High performance stepper module with RS232 indexer and bipolar microstepping drive.**

The CD6410M is suitable for stepper motors with the holding torque from 3 Nm to 22 Nm.

#### ◆ Driver

- Bipolar chopper drive for two-phase stepper motors
- Motor current amplitude up to 7 A peak / phase
- Programmable microstepping for smooth operation - binary step size (from 2 to 256 microsteps per full step), decimal step size (from 5 to 250 microsteps per full step)
- Current reduction during rest to reduce motor heating
- Patented 4-phase bipolar chopper drive for superior current regulation and low ripple current
- **Patented digital electronic damping reduces instability at speeds in middle of operating range**
- User selectable motor current in eight levels from 0,625 A rms to 5 A rms
- Drive disable possibility by means of user input as well as indexer command
- Single unregulated supply voltage between 24 V and 75 V

#### ◆ Indexer

The indexer is equipped with the M1486 controller which provides simple and flexible stepper motor control.

The M1486 controller includes:

- **Programmable stepper motor controller**  
(distance, velocity, acceleration, microstepping)
- **Small programmable logic controller**  
(inputs/outputs, loops, conditional jumps, dwells)

Complete machine control can be simply executed by using a controller command file. See page 10 and 11 for details about the controller commands - standard ASCII characters.

The module can be linked to a PC or any host computer equipped with the RS232 interface. The module serial port is opto-isolated. Up to 16 modules can be controlled from one host computer using a single port for multi-axis control.

#### - Stand Alone Mode

After command file is downloaded the module can be used in a stand alone application. In the stand alone mode the internal EEPROM memory enables pre-programmed move sequences to be repeated off line.

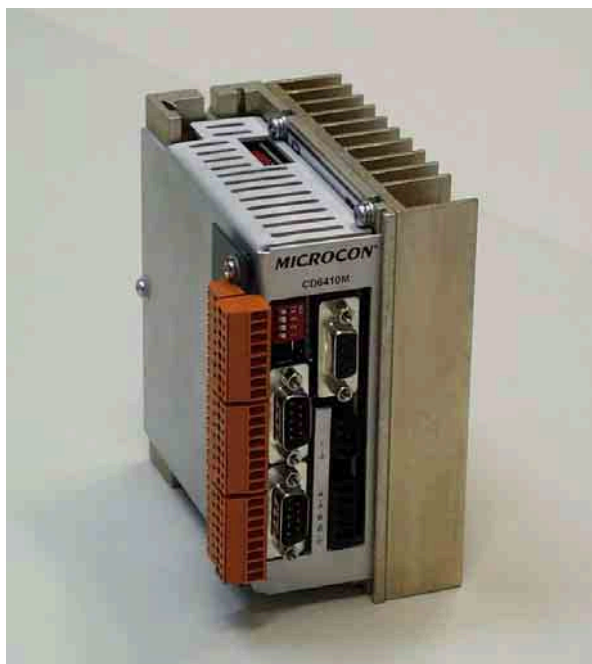
#### - User Inputs/Outputs

The module provides digital user inputs/outputs which are available to initiate or monitor external events.

- **14 opto-isolated user inputs** - 24 V level (5 V optional)
- **6 user outputs**

#### - Applications

The module enables quick solution of application requirements with flexible changes possibility using modified command file when needed.



#### ◆ Technical Specifications

##### - Driver Specifications

Supply voltage ..... 24 to 75 V  
Motor current amplitude / phase ..... 7 A peak

Torque speed characteristics of the CD6410M module with stepper motors - see page 24, 25.

##### - Indexer Specifications

See the M1486 controller description on page 10 and 11.

##### - User Inputs

All user inputs are opto-isolated for a high noise immunity. Input optocouplers with bipolar input photo diode allows common anode or common cathode connection. It is possible to connect both sink and source outputs.  
The standard input level is 24 V (5 V is optional).

##### - User outputs

Open collector outputs (up to 30 V).  
Low level output current ..... 100 mA  
24 V source drivers (switchable to 5 V output level) are optional - please add A1 appendix to the module name.  
High level output current ..... 40 mA

##### - Input and Output Connectors

RS232 serial port input ..... CANNON 9 Pin/M  
RS232 serial port output ..... CANNON 9 Pin/M  
User inputs/outputs..... removable screw terminal - 24 way  
Stepper motor..... removable screw terminal - 5 way  
Power supply..... removable screw terminal - 3 way

##### - Dimensions

127x110x80 mm (with cover and heat sink)

##### - Accessories

Cover, heat sink, connector kit, user manual



## STEPPER INDEXER/DRIVE MODULES

### CDZMP-Mini

**High performance stepper module with RS232 indexer and bipolar microstepping drive.**

The auxiliary board - MB-Mini with overvoltage protection can be used for easier motor and power supply connection through the screw terminals.

ZMP-Mini driver specifications - see page 15, indexer specifications below - the C1 board.

**The CDZMP-Mini module is suitable for stepper motors with the holding torque from 11 Nm to 40 Nm.**

## STEPPER INDEXER BOARD

### C1 Board

#### RS232 indexer - M1486 controller

The indexer is equipped with the M1486 controller which provides simple and flexible stepper motor control.

The M1486 controller includes:

- **Programmable stepper motor controller**  
(distance, velocity, acceleration, microstepping)
- **Small programmable logic controller**  
(inputs/outputs, loops, conditional jumps, dwells)

Complete machine control can be simply executed by using a controller command file. See page 10 and 11 for details about the controller commands - standard ASCII characters. The indexer board can be linked to a PC or any host computer equipped with the RS232 interface. Up to 16 boards can be controlled from one host computer using a single port for multi-axis control.

#### - Stand Alone Mode

After command file is downloaded the board can be used in a stand alone application. In the stand alone mode the internal EEPROM memory enables pre-programmed move sequences to be repeated off line.

#### - User Inputs/Outputs

The board provides digital user inputs/outputs which are available to initiate or monitor external events.

#### - 12 opto-isolated user inputs

All user inputs are opto-isolated for a high noise immunity. Input optocouplers with bipolar input photo diode allows common anode or common cathode connection. It is possible to connect both sink and source outputs.

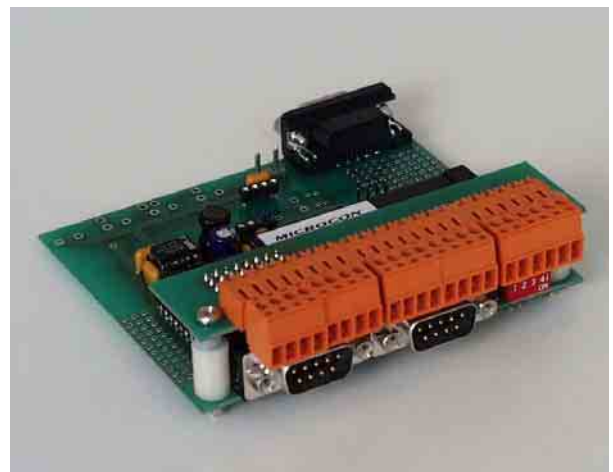
The standard input level is 24 V (5 V is optional).

#### - 6 user outputs - open collector outputs (up to 30 V)

Low level output current..... 100 mA

24 V source drivers (switchable to 5 V output level) are optional - please add A1 appendix to the board name.

High level output current ..... 40 mA



#### - Input and Output Connectors

RS232 serial port input .....	CANNON 9 Pin/M
RS232 serial port output .....	CANNON 9 Pin/M
User inputs/outputs .....	removable screw terminal - 22 way
Power supply.....	removable screw terminal - 2 way
Stepper motor drive outputs -	
Step and Direction signals, Enable .....	CANNON 9 Pin/F

#### - Dimensions

85x100x35 mm

#### The C1 board can be used as follows:

- independent small programmable logic controller for universal applications
- programmable stepper motor controller with Step and Direction outputs for external drive; small programmable logic controller is also available.

## STEPPER MOTOR CONTROLLER M1486

- ◆ **FULLY PROGRAMMABLE SINGLE CHIP INDEXER AND SEQUENCER**
- ◆ **MOTOR SPEEDS UP TO 40 000 STEPS/SEC**
- ◆ **UP TO 64 MICROSTEPS PER STEP**
- ◆ **HIGH PERFORMANCE MOTION PROFILES**
- ◆ **ONE STANDARD AND TWO MICROSTEP MODES OF DRIVER INTERFACE:**
  - STEP AND DIRECTION
  - DUAL DAC INTERFACE
  - TWO DACs INTERFACE
- ◆ **POWERFUL INSTRUCTION SET OF MORE THAN 50 COMMANDS**
- ◆ **16 MILLION STEPS PER MOTION**
- ◆ **INTERNAL MEMORY ENABLES PRE-PROGRAMMED MOVE SEQUENCES TO BE REPEATED OFF-LINE**
- ◆ **UP TO 21 GENERAL PURPOSE I/O**
- ◆ **PROGRAMMABLE MAXIMUM VELOCITY, START/STOP VELOCITY, ACCEL/DECEL RAMPS, MICROSTEPPING CURRENT PROFILES**
- ◆ **ESPECIALLY SMOOTH ACCELERATION AND DECELERATION**
- ◆ **SERIAL HOST INTERFACE, UP TO 16 DEVICES PER PORT**
- ◆ **LOW POWER CMOS, TTL COMPATIBLE CHIP**
- ◆ **AVAILABLE IN 40-PIN DUAL IN-LINE (DIP) OR 44-PIN PLCC PACKAGES**

The M1486 controller provides the user with an integration of precision motion control with other programmable machine control functions such as I/O on a single chip, thus eliminating a need to use additional units for complete machine control.

### - Powerful Command Language

The M1486 commands and data are sent from the host computer via a serial link as ASCII code (it is possible to use both uppercase and lowercase alpha characters). The user can employ any text editor for ASCII command files constructing. New commands are sent via the RS232 interface. Up to sixteen controllers may be daisy-chained by setting up the address of each controller to allow simultaneous control of multiple axes. The baud rate can be set at one of four speeds, from 1200 to 9600 bits/sec.

A broad palette of 50 commands is provided to enable to implement various application requirements using command file only. These requirements often encroach upon PLC field - command file branching according to user input status, outputs, loops, dwells. A small PLC that provides above mentioned functions is therefore integrated in the M1486 controller and is controlled by command file.

Complete application solution through a command file is easier and faster than a hardware solution and in addition command file can be flexibly changed according to application requirements. Controller commands are very simple and easy to remember. The first letter of the command name is a code of all basic commands. For example the "Velocity" command 500 steps/sec: *V500*. For programming simplicity the M1486 controller (indexer part of the CD series boards and modules) is also suitable for users without programming experience.

### - Stand Alone Mode

The controller can be linked to a PC or any host computer equipped with the RS232 serial port only once for command file transmitting. The controller can be used in stand alone applications. In the stand alone mode the internal memory enables pre-programmed move sequences to be repeated off line. The program stored in the memory can be easily changed by re-connecting a computer and transmitting changed command file.

### - Minimum Torque Necessary For Accel/Decel

The precise and smooth speed control method including high speed range explores maximum of the stepper motor torque in an open loop system, allowing the use of a smaller motor and more compact driver package. This means lower motor and drive costs or increased safety margin of an open loop stepper motor system.

While many motion controllers available today use the trapezoidal velocity profile, this profile has serious drawbacks at a speed range where motor torque decreases. The "Profile" command enables the programmer to set a point where acceleration characteristic changes from linear to parabolic and back at deceleration.

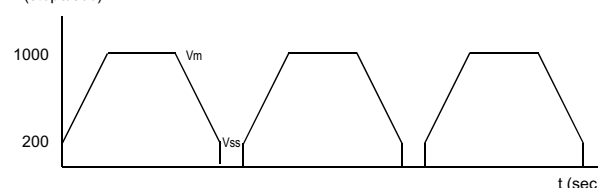
### - Microstepping

The M1486 provides higher step resolution that virtually eliminates low speed resonance and step-to-step oscillation in stepper motor systems. The number of microsteps per full step can be programmed from 1 to 64 separately for the low speed range and the high speed range in order to achieve maximum speed as well as very high resolution at low speed. The driver interface of the M1486 controller outputs digital values of phase currents for both phases of a stepper motor. Standard Step and Direction outputs for an external drive control are also available.

### - Motion Program Example:

```
S200 .....;"Start/stop" - start/stop velocity 200 steps/sec
V1000 .....;"Velocity" - 1000 steps/sec
A5000 .....;"Acceleration" - 5000 steps/sec²
F39616 .....;"Forward" - 39616 microsteps in positive direction
L3.....;"Loop" - the subsequent commands will be repeated
               three times until the "End of loop" command
R.....;"Run" - make a specified move
W250 .....;"Wait" - wait for 250 milliseconds
E .....;"End of loop"
```

V (steps/sec)



## STEPPER MOTOR CONTROLLER M1486

### - Numeric Unit

The M1486 provides the numeric unit for more complex applications. The numeric unit is controlled by nine commands which use internal variable. The actual value of the internal variable may be specified by means of the "Load" command directly or through the user inputs by the "Query" command. The numeric operations add, subtract, multiply and divide are available and can be used for internal variable modification. The internal variable data can be moved to a register and back. The value of the internal variable may be used as argument of the M1486 commands. For example if velocity is set by the command "V" without argument, the actual value of the internal variable is used as argument.

The command arguments can thus be specified also in stand alone applications by user inputs (binary or BCD format) without the serial link.

It is possible to cope with most application specifications using a small number of commands only. However powerful command set is provided to enable easy and complete solution of complex applications by command file only, without additional external hardware.



### M1486 FAMILY MEMBERS

#### M1486A

- 96 bits input buffer, RAM command memory  
864 bits, speed up to 20 000 steps/sec  
(M1486A2x up to 40 000 steps/sec)

#### M1486B

- pin and function compatible with M1486A,  
80 labels, 256 bits input buffer, RAM command  
memory 2032 bits

The customer version of controllers M1486A,  
M1486B with user command file in non-volatile  
memory on-chip are available for a mass  
production.

#### M1486C

- pin and function compatible with M1486A,  
RAM command memory 4000 bits, four integrated  
8-bit PWM outputs

#### M1486E1

- pin and function compatible with M1486A,  
80 labels, 256 bits input buffer, on-chip  
2000 bits EEPROM command memory -  
the commands are automatically executed on  
power-up without battery back-up

#### M1486E2

- pin and function compatible with M1486E1,  
80 labels, 256 bits input buffer, on-chip  
4000 bits EEPROM command memory

All above mentioned controller types are also  
delivered in two times faster versions 2x, that can  
use 24 MHz crystal. The controller runs two  
times faster in this case.

More details in the M1486 user's manual.

### Command Summary

Command	Description
\	"Reset" - set default values
@ (Num)	"Address" - specifies label number on current program line
A (Num)	"Acceleration" - range = 1 to 65 000 steps/sec <sup>2</sup>
B (Num)	"Backward" - move (Num) steps in negative direction; range = 1 to 16 000 000
C (Num 1 to 21)	"Clear" - clear output; range = 1 to 21
C (Num 40 to 63)	"Clear" - clear auxiliary function; range = 40 to 63
C75	"Clear Kill" - resume program execution
D	"Direction" - reverse next move direction
E	"End of loop"
F (Num)	"Forward" - move (Num) steps in positive direction; range = 1 to 16 000 000
G (Num)	"Go absolute" - go to absolute position
G+	"Go positive" - go continuously in positive direction till external interrupt
G-	"Go negative" - go continuously in negative direction till external interrupt
H	"Home" - run home
I (Num) (Value) (Num)	"If" - if (Num) input is equal to (Value) transfers program control to the (Num) label
J (Num)	"Jump" - transfers program control to the (Num) label
K	"Kill" - decelerate immediately, stop program execution
L (Num)	"Loop" - repeat subsequent commands (Num) times
M (Num)	"Microstepping" - number of microsteps per full step at low speed range (up to 64)
N (Num)	"Number" - select current profile characteristic
O (Num)	"One" - wait for input (Num) to go to logical one
P (Num)	"Profile" - set maximum velocity for linear acceleration profile, acceleration continues with parabolic profile
Q (Num)	"Qualification" - number of microsteps per full step at high speed range (up to 16)
R	"Run" - make a move
S (Num)	"Start/stop" - start/stop velocity; range = 16 to 1950 steps/sec
T (Num 1 to 21)	"Turn on" - set specified output high; range = 1 to 21
T (Num 40 to 63)	"Turn on" - turn specified auxiliary function on; range = 40 to 63
U (Num)	"Upload" - upload absolute position, user variable, user flags and auxiliary functions status
V (Num)	"Velocity" - set maximum velocity
W (Num)	"Wait" - wait for (Num) milliseconds; range = 1 to 16 000 000
X (Num)	"index" - select indexer (Num)
Z (Num)	"Zero" - wait for input (Num) to go to logical zero
[	"Disable" - following commands execution
]	"Enable" - previous commands execution
( (Num)	"Seek negative" - seek limit in negative direction
) (Num)	"Seek positive" - seek limit in positive direction
= (Num)	"Equal" - load position counter with specified data
: (Num)	"Load" - load internal variable with specified data
? (Num)	"Query" - query data on specified inputs and load them to internal variable
! (Num)	"Order" - put user variable data to specified outputs
+ (Num)	"Add" - add specified data to user variable
- (Num)	"Subtract" - subtract specified data from user variable
/ (Num)	"Divide" - divide user variable by specified data
* (Num)	"Multiply" - multiply user variable and specified data
> (Num)	"Move to register" - copy data from specified register to user variable
< (Num)	"Move from register" - copy data from user variable to specified register
' (Num)	"Subroutine" - call subroutine starting at specified label
.	"End of subroutine"

## INMOTION PC UTILITIES for Stepper Motor Controller M1486

Inmotion PC Utilities software is available for M1486 indexer and microstepping sequencer program generation, editing and validation. The software filters each command for proper format and parameter values. The software communicates directly with the stepper motor controller via the RS232 serial interface (COM1 or COM2 of a PC).

Inmotion provides integrated multiwindow development environment. It employs multiple overlapping and resizable windows. Windows have scroll bars, close boxes and zoom boxes. They can be controlled by using the mouse with pull down menus or by keyboard shortcuts.

In order to minimize keystrokes it employs the computers function keys for the main commands, such as file handling commands, DOS Shell and frequent motion commands. All dialog boxes that require the user to enter text keep a scrolling history list, so you can reuse previous entries. Furthermore, Inmotion provides integrated calculator, ASCII table, and directory browser.

### - Motion Calculator

The motion calculator provides the possibility to calculate any motion parameter after remaining motion parameters specification. For example, the motion calculator gives total time of movement and times of individual parts of movement after start/stop velocity, maximum velocity, acceleration and distance specification.

### - Transmitted Command Memory

The user can open a scrollable trace buffer window with last 100 commands sent to the controller from a computer via the RS232 serial port - "Trace Window" command. The contents of this window can be saved to a disk for repeated transmitting.

### - Help

Inmotion has the context sensitive scrollable help available by pressing F1. The user can work with the help window as with any other window in Inmotion.

### - Menu

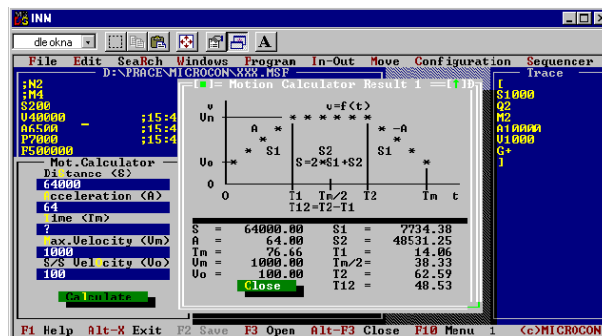
The upper menu line includes the additional menus. This one is available by pressing F10 or by mouse click anywhere on the upper menu line. The user can choose one of the following items:

#### a) basic menu

**File**  
**Edit**  
**Search**  
**Windows**

#### b) menu containing the controller M1486 commands

**Program** (Small programmable logic controller commands)  
**In-Out**  
**Move** (Motion control commands)  
**Configuration**  
**Sequencer**



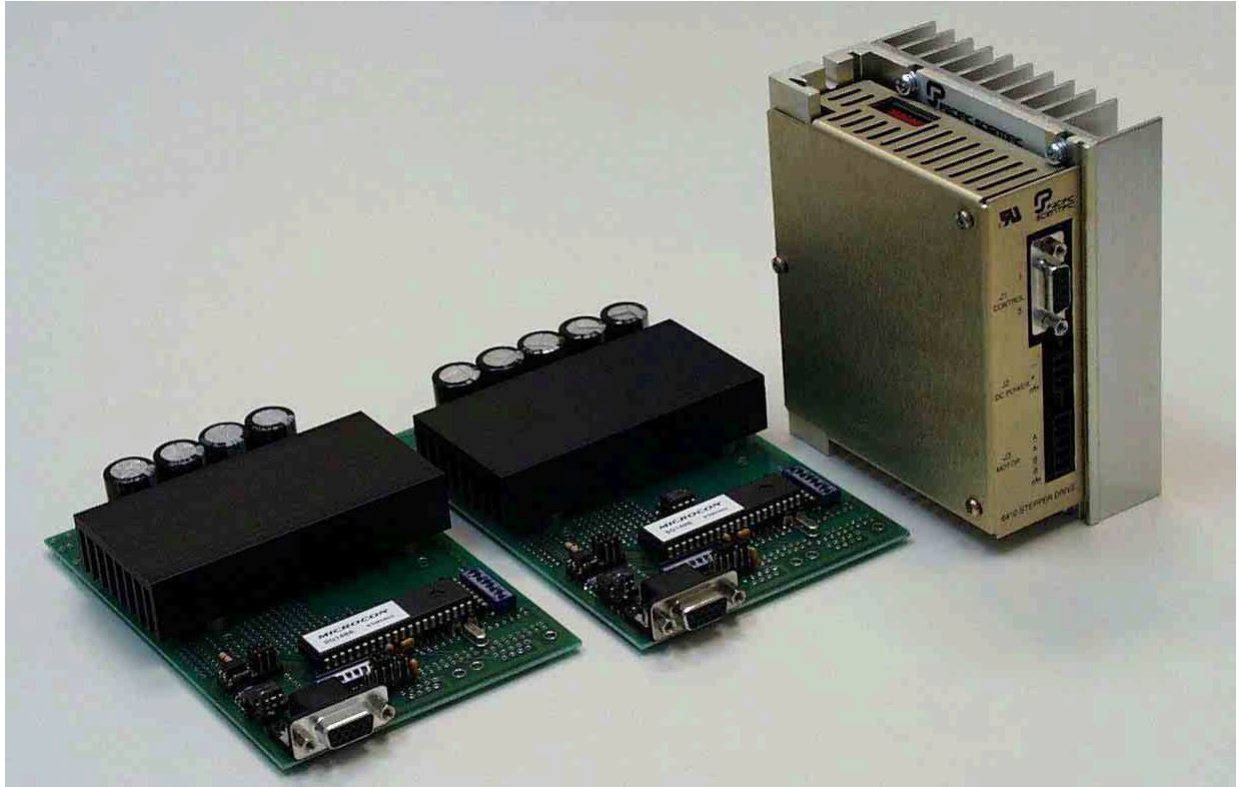
Inmotion PC Utilities enables programs to be created off-line on a PC and then downloaded to the controller as well as motion commands to be sent immediately after typing.

### - Inmotion PC Utilities compiled for Windows 95/98/2000

Inmotion PC Utilities new version provides some better functions in comparison with previous versions:

- motor torque calculation from load inertia and acceleration parameters; acceleration can be calculated if total time and distance are specified
- dwells between commands transmitting for EEPROM write are computer speed independent
- controller type identification, motion program length testing according to the controller type
- memory of the last settings (controller type, baud rate, serial port used).

## MICROSTEPPING STEPPER DRIVES - SD SERIES BOARDS, MODULES



### General Description

Stepper drives are controlled by the Step, Direction and Disable inputs.

The SD series boards and modules provide higher step resolution that virtually eliminates low speed resonance and step-to-step oscillation in stepper motor systems.

### Where To Use

Two-phase stepper motors bipolar chopper driving.

### Max. Motor Current Amplitude

2 A - 14 A

### Supply Voltage

12 V<sub>DC</sub> - 140 V<sub>DC</sub>



## MICROSTEPPING STEPPER DRIVES

### SD Series Boards

The SD series boards are stepper drives converting Step and Direction inputs into winding currents for two-phase stepper motors.

#### ◆ Sequencer

The SD series boards are controlled by the Step, Direction and Disable inputs. All inputs are optically isolated. The Step input is isolated by a high-speed optocoupler with internal shield. The maximum stepping rate is up to 20 kHz for S version, or up to 40 kHz for F version.

One microstep is executed when the Step signal changes from opto current off to opto driven. It is possible to change motion direction by driving the Direction input opto. Disable input is used to disable the driver if opto is driven or enable the driver if opto current is off. Input signals standard logic level is 24 V (5 V level optional).

The SD series drives are equipped with the sequencer SQ1486 and do not include programmable controller M1486. The sequencer is designed to receive Step and Direction signals and convert them to digital values of phase current for both phases of a stepper motor.

#### ◆ Driver

- Bipolar chopper driver for two-phase stepper motors (4, 6 or 8 flying leads), the power amplifier is included
- 4-bit DACs for smoother motor operation - 8 and 16 microsteps per full step also available
- Current reduction during rest to reduce motor heating - SD30M, SD40M
- Single unregulated supply voltage between 12 V and 48 V (35 V - SD20M)

#### ◆ Technical Specifications

	SD20M	SD30M	SD40M
Motor current amplitude range / phase (A peak)	0,4 - 2	0,4 - 3,3	0,4 - 4
Supply voltage range (V)	12 - 35	12 - 48	12 - 48
Opto-isolated Step, Direction and Disable inputs	YES	YES	YES
Max. microsteps per full step	16	16	16
Current reduction during rest - switch 8 OFF	NO	YES	YES
On-board electrolytic capacitor (µF)	4 000	5 000	5 000
Motor current amplitude levels	8	16	16
Motor current profile settings	15	15	15
Suitable stepper motors - holding torque range (Nm)	0,15 - 1,2	1,2 - 8,5	3 - 8,5
Dimensions (mm), eurocard-sized boards	160x100x30	160x100x30	160x100x45



The stabilized power supply is not necessary due to the motor current chopper regulation. Only a transformer and a diode bridge are sufficient. An external power supply capacitor can be omitted due to the electrolytic capacitor 4 000 µF (5 000 µF) on the board.

Torque speed characteristics of the SD drives with stepper motors are identical to the CD board characteristics (for example SD30M/CD30M) - see pages 23 and 24.

The microstepping mode, current profile and motor current amplitude can be set up by means of DIP switches. Motor current amplitude can be set in 8 levels (SD20M) or 16 levels (SD30M, SD40M).

The SD series drives have internal 5 V switching power supply.



## MICROSTEPPING STEPPER DRIVES

## 6410-001

High performance stepper drive converting Step and Direction inputs into winding currents for two-phase stepper motors with the holding torque from 3 Nm to 22 Nm.

## ◆ Driver

- Motor current amplitude up to 7 A peak / phase
- Single unregulated supply voltage between 24 V and 75 V
- Bipolar chopper drive for two-phase stepper motors
- Programmable microstepping for smooth operation - binary step size (from 2 to 256 microsteps per full step), decimal step size (from 5 to 250 microsteps per full step)
- Current reduction during rest to reduce motor heating
- Patented 4-phase bipolar chopper drive for superior current regulation and low ripple current
- **Patented digital electronic damping reduces instability at speeds in middle of operating range**
- User selectable motor current in eight levels from 0,625 A rms to 5 A rms
- Drive disable possibility by means of user input
- All inputs are opto-isolated

Torque speed characteristics - see page 24, 25 - CD6410M.

## - Dimensions

127x110x65 mm (with cover and heat sink)

## - Accessories

Cover, heat sink, connector kit, user manual



Pacific Scientific product.

## ZMP-Mini

High performance stepper drive converting Step and Direction inputs into winding currents for two-phase stepper motors with the holding torque from 11 Nm to 40 Nm.

## ◆ Driver

- Motor current amplitude up to 14 A peak / phase ("Boost" function - 17 A peak)
- Supply voltage up to 140 V
- Bipolar chopper drive for two-phase stepper motors
- Programmable microstepping for smooth operation - 2 1/2 or 5 microsteps per full step
- Current reduction during rest to reduce motor heating
- Optimum run of the stepper motor thanks to phase sequence synchronous chopped current regulation (patented circuit)
- Short-circuit protection
- Electronic monitoring: temperature, short-circuits, undervoltage
- User selectable motor current in nine levels from 2 A rms to 10 A rms
- Drive disable possibility by means of user input

Torque speed characteristics - see page 25 - CDZMP-Mini

## - Dimensions


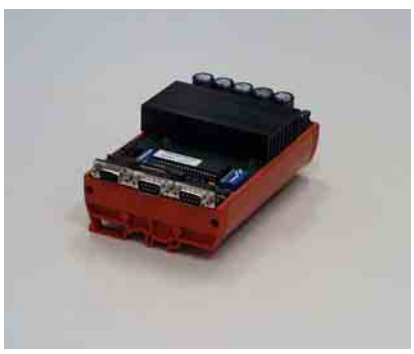

165x100x65 mm, eurocard-sized module



Pacific Scientific - Bautz product.

See the data sheets for further details.

## UNITS MOUNTING

		
General Description		
The CD series board with two mounting holes can be fixed above some board using screws, insulators and spacers.	The board holder can be snapped onto standard DIN rails.	Euro-racks 19", half width also available (see above).
Where To Use		
This mounting is possible for CD, SD series boards and the C1 board. The unit can be fixed above the other board for place saving.	Available for eurocard-sized units; CD, SD series boards, the C1 board and ZMP-Mini module. Fast and easy mounting.	Euro-racks can be used for eurocard-sized units; CD, SD series boards, CD34M, ZMP-Mini, CDZMP-Mini modules. Preferable solution for a large number of units.

The 6410-001, CD6410M modules can be mounted to a back panel directly using screws inserted through the mounting slots or holes on the back of the units.

See the data sheets for further mounting details.

## HYBRID STEPPER MOTORS

**SM Series**



**SL Series**



### General Description

Hybrid two-phase stepper motors provide benefits such as the high torques with small dimensions (the highest torques per frame size in industry), high efficiency, low inertia rotor and high step accuracy. The 8-lead motor is the most versatile configuration, it may be connected by the user in series or parallel configuration (for bipolar drive) or as four-phase motor (unipolar connection - 5 leads to power drive). Nevertheless bipolar drive is more suitable for maximum motor performance.

### Where To Use

In general stepper motors are recommended for precise and cost sensitive applications with moderate speed requirements.

### Holding Torque

**0,8 - 40 Nm**

**0,15 - 5 Nm**

### Angular Accuracy

$\pm 0,06^\circ$

$\pm 0,1^\circ$

### Full Steps Per Revolution / Full Step Angle

200 /  $1,8^\circ$  (electronic microstepping is available)

Besides the standard selection of motor types mentioned in this catalogue, additional models (other windings, holding torques, various shaft modifications, etc.) are offered.

## SM23 Series - Technical Parameters

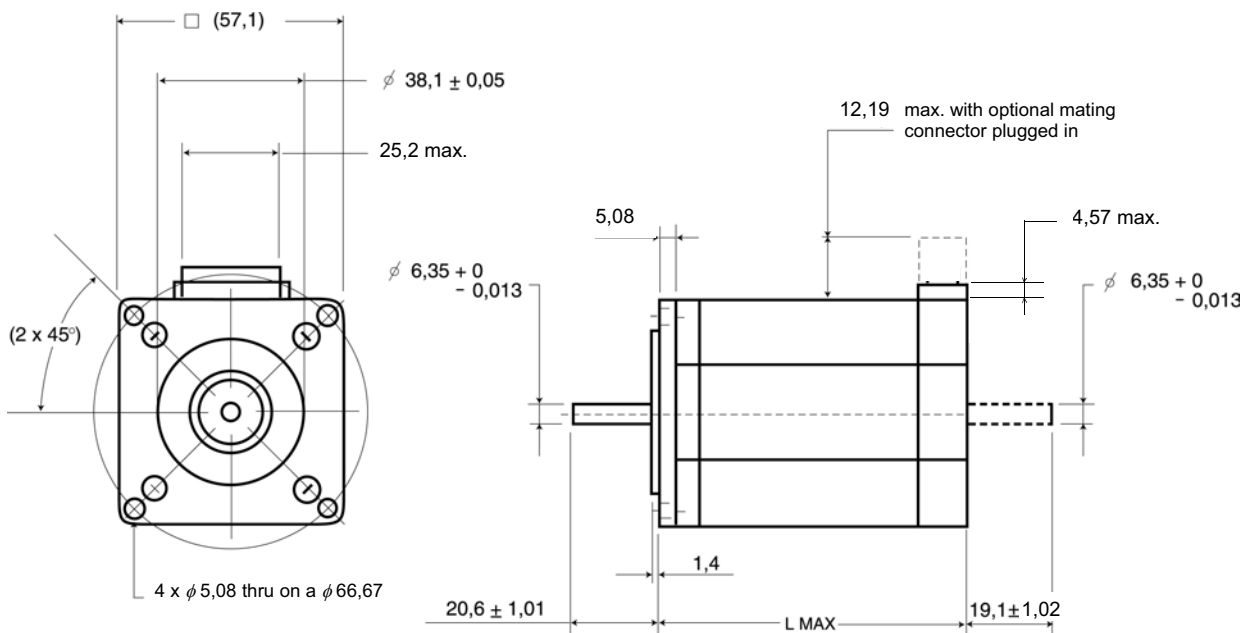
POWERMAX - Pacific Scientific

Model	Holding Torque (2 phases on) (Nm)	Rated Current/ Phase (A) series / parallel	Phase Inductance (mH) series / parallel	Phase Resistance (Ω) series / parallel	Detent Torque (Nm)	Highest Running Torque for 500 Hz (Nm)	Rotor Inertia (kg m <sup>2</sup> 10 <sup>-3</sup> )	Weight (kg)
SM2317-0800 (P21NRXC)	0,8	1,75 / 3,5	9,2 / 2,3	2,12 / 0,53	0,028	0,64	0,012	0,68
SM2321-1400 (P22NRXB)	1,5	2,3 / 4,6	8,4 / 2,1	1,52 / 0,38	0,049	1,1	0,025	1,13
SM2321-1800 (M22NRXB)	1,8		6,8 / 1,7		0,12	1,35		
Additional models (other windings, double shaft configuration, etc.) are offered.								

NEMA 23 Frame	.....	Frame outer dimensions 57,1 x 57,1 mm
Full Step Angle	.....	1,8°
Angular Accuracy	.....	± 0,06°
Insulation	.....	NEMA Class B, 130° C

### Dimensions (mm)

Series	Shaft φ	Length L max
<b>SM2317</b>	6,35	52,4
<b>SM2321</b>		78,8





## SM40 Series - Technical Parameters

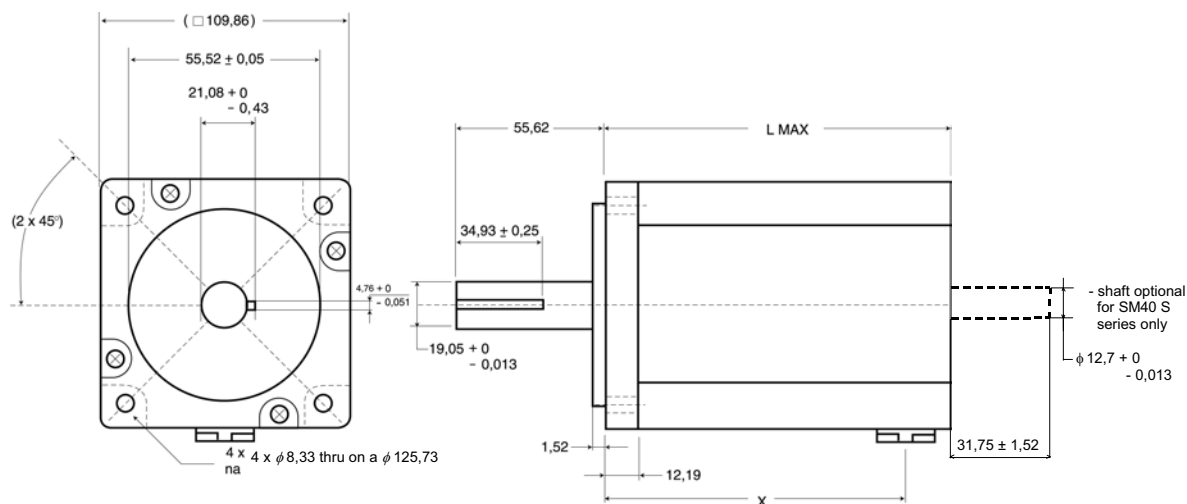
POWERPAC - Pacific Scientific

Model	Holding Torque (2 phases on) (Nm)	Rated Current/ Phase (A)	Phase Inductance (mH)	Phase Resistance (Ω)	Detent Torque (Nm)	Highest Running Torque for 500 Hz (Nm)	Rotor Inertia (kg m <sup>2</sup> 10 <sup>-3</sup> )	Weight (kg)
		series / parallel	series / parallel	series / parallel				
<b>SM41-2711IP</b> (N41HMFJ)	<b>11</b>	2,7 / 5,5	40,4 / 10,1	2,33 / 0,58	0,3	8	0,55	4,98
<b>SM41-5311S</b> (N41HRLM)		5,3 / -	11,1 / -	0,63 / -				
<b>SM41-5311IP</b> (N41HMFМ)		5,3 / 10,7	11,1 / 2,8	0,63 / 0,16				
<b>SM42-4922S</b> (N42HRLM)	<b>22</b>	4,9 / -	22 / -	1,02 / -	0,59	15	1,09	8,34
<b>SM42-4922IP</b> (N42HMFМ)		4,9 / 9,9	22 / 5,5	1,02 / 0,25				
<b>SM43-4930S</b> (N43HRLM)	<b>30</b>	4,9 / -	30,7 / -	1,32 / -	0,75	21	1,62	11,64
<b>SM43-4930IP</b> (N43HMFМ)		4,9 / 9,9	30,7 / 7,7	1,32 / 0,33				
<b>SM43-7730IP</b> (N43HMFN)		7,7 / 15,4	13 / 3,2	0,55 / 0,14				
<b>SM43-4940IP</b> (K43HMFМ)	<b>40</b>	4,9 / 9,9	23,7 / 5,9	1,32 / 0,33	0,83	29		
Additional models (other windings, double shaft configuration, etc.) are offered.								

NEMA 42 Frame	Frame outer dimensions 109,86 x 109,86 mm
Full Step Angle	1,8°
Angular Accuracy	± 0,06°
Insulation	NEMA Class B, 130° C
<b>Motor Sealing - SM40IP Series</b>	<b>IP65</b>
Shaft Sealing - SM40IP Series	IP65 (without auxiliary shaft sealing IP54)

### Dimensions (mm)

Series	Shaft $\phi$	Length	
		L max	X
SM41 S / IP	19,05	98,81 / 132,08	- / 113,28
SM42 S / IP		150,11 / 183,39	- / 164,59
SM43 S / IP		201,17 / 234,44	- / 215,65





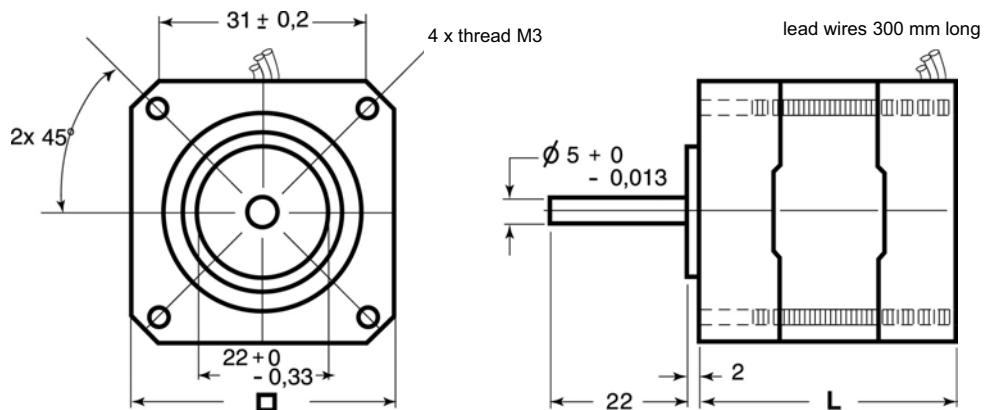
## SL17, SX17 Series - Technical Parameters

Model	Holding Torque (2 phases on) (Nm)	Rated Current/ Phase (A) series / parallel	Phase Inductance (mH) series / parallel	Phase Resistance (Ω) series / parallel	Detent Torque (Nm)	Highest Running Torque for 50 Hz (Nm)	Rotor Inertia (g cm <sup>2</sup> )	Weight (kg)
SL17-0301	0,15	0,3 / 0,6	80 / 20	40 / 10	0,006	0,12	25	0,22
SL17-0601		0,6 / 1,2	28 / 7	14 / 3,5				
SX17-0502	0,25	0,5 / -	30 / -	15 / -	0,01	0,2	27	0,2

SL17 - NEMA 17 Frame ..... Frame outer dimensions □ 40 x 40 mm  
 SX17 - NEMA 17 Frame ..... Frame outer dimensions □ 38,8 x 38,8 mm  
 Full Step Angle ..... 1,8°  
 Angular Accuracy ..... ± 0,1°  
 Insulation ..... NEMA Class B, 130° C

### Dimensions (mm)

Series	Shaft φ	Length L
SL17	5	39
SX17		37



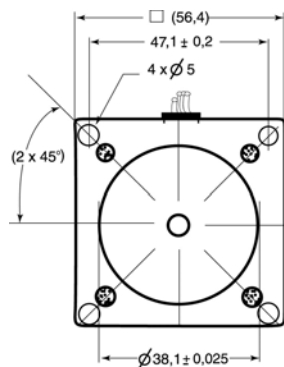
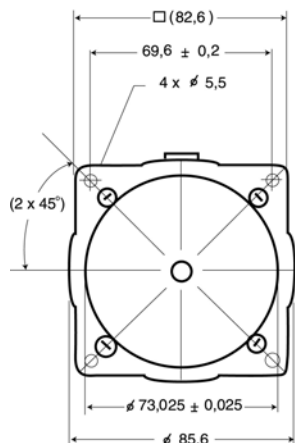
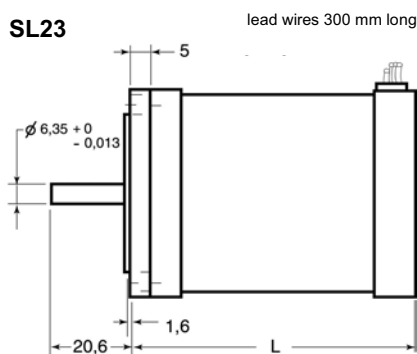
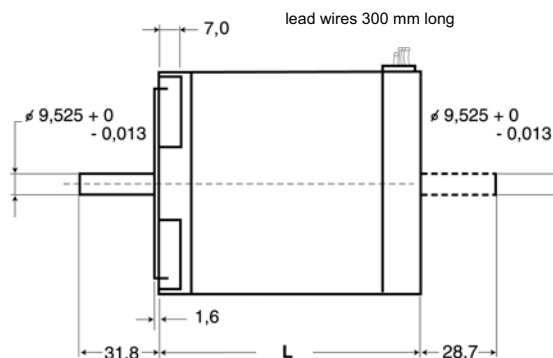
## SL23, SL34 Series - Technical Parameters

Model	Holding Torque (2 phases on) (Nm)	Rated Current/ Phase (A) series / parallel	Phase Inductance (mH) series / parallel	Phase Resistance (Ω) series / parallel	Detent Torque (Nm)	Highest Running Torque for 400 Hz (Nm)	Rotor Inertia (kg m <sup>2</sup> 10 <sup>-4</sup> )	Weight (kg)
SL23-0704	0,35	0,7 / 1,4	22,8 / 5,7	10 / 2,5	0,015	0,25	0,06	0,34
SL23-1012	1,2	1 / 2	27,2 / 6,8	7,6 / 1,9	0,05	0,9	0,23	0,85
SL23-2812		2,8 / 5,6	3,2 / 0,8	1,2 / 0,3				
SL34-2530	3	2,5 / 5	16,8 / 4,2	1,6 / 0,4	0,1	2,6	1,1	2,6
SL34-3550	5	3,5 / 7	8 / 2	0,9 / 0,23	0,12	4	1,8	3,6
SL34 Series - double shaft configuration available.								

SL23 - NEMA 23 Frame ..... Frame outer dimensions 56,4 x 56,4 mm  
 SL34 - NEMA 34 Frame ..... Frame outer dimensions 82,6 x 82,6 mm  
 Full Step Angle ..... 1,8°  
 Angular Accuracy ..... ± 0,1°  
 Insulation ..... NEMA Class B, 130° C

### Dimensions (mm)

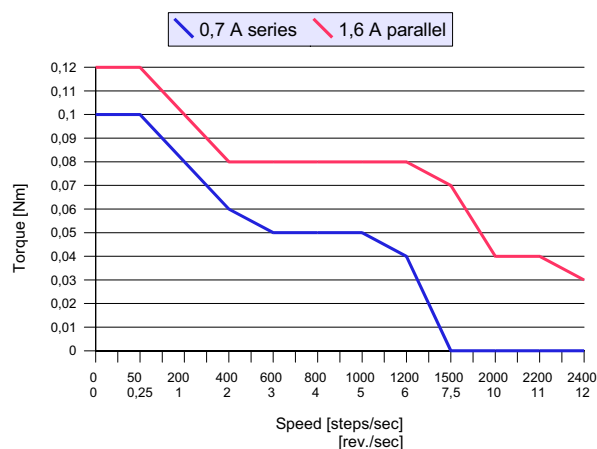
Model	Shaft $\phi$	Length L
SL23-0704	6,35	38,5
SL23-1012 (2812)		76
SL34-2530	9,525	94
SL34-3550		128


**SL23**

**SL34**


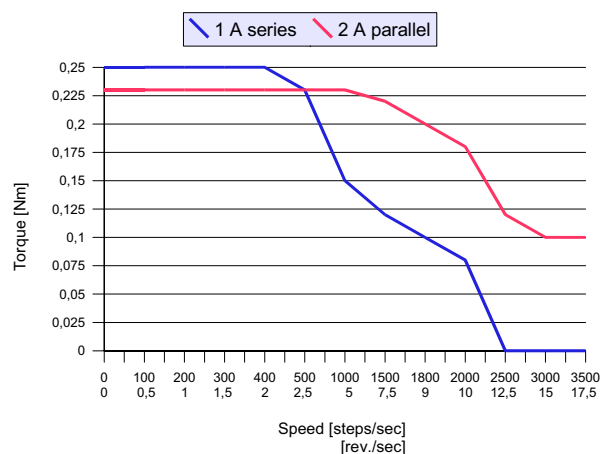
# TORQUE SPEED CHARACTERISTICS

## SL Series

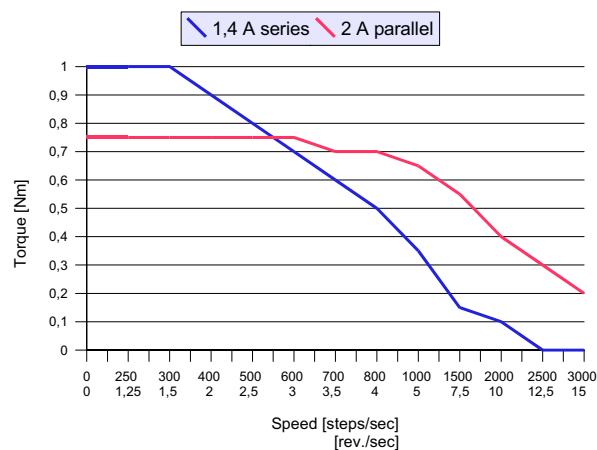
Torque/speed curves of SL17-0601 stepper motor with CD20M board for 35 VDC



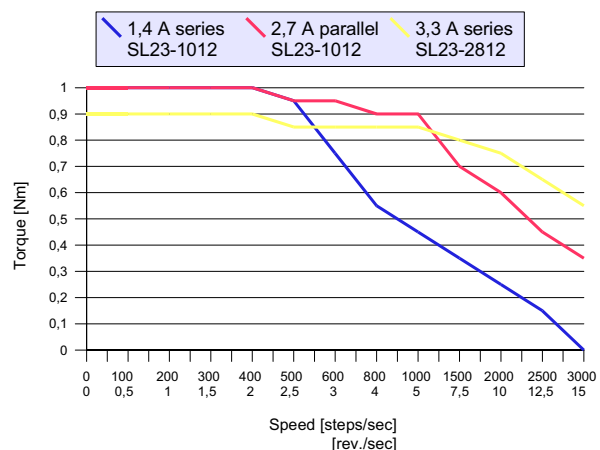
Torque/speed curves of SL23-0704 stepper motor with CD20M board for 35 VDC



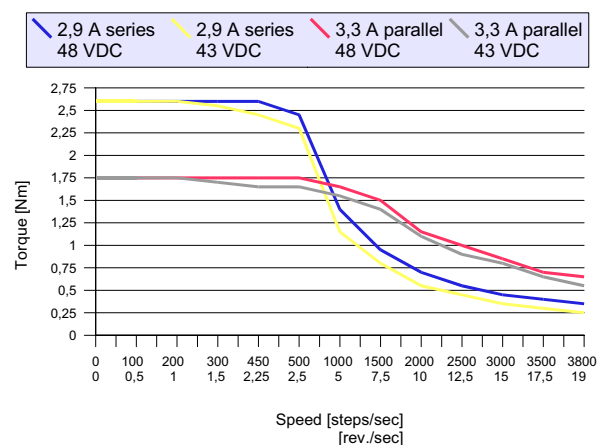
Torque/speed curves of SL23-1012 stepper motor with CD20M board for 35 VDC



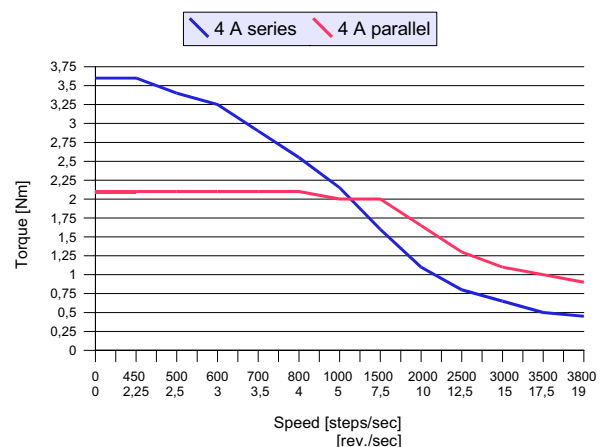
Torque/speed curves of SL23-1012 (SL23-2812) stepper motor with CD30M board for 48 VDC



Torque/speed curves of SL34-2530 stepper motor with CD30M board for 43 VDC and 48 VDC



Torque/speed curves of SL34-3550 stepper motor with CD40M board for 48 VDC

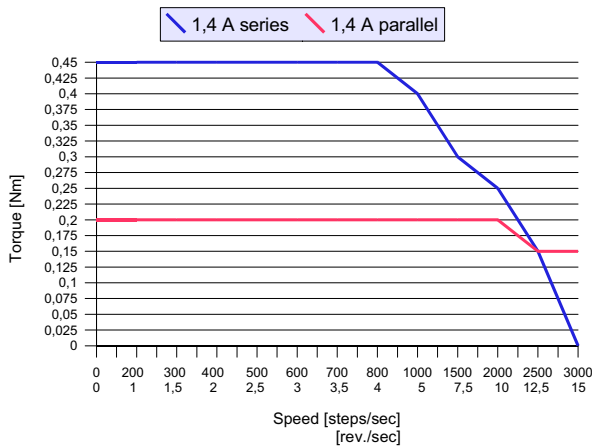


Motor current amplitude / phase is included in the legends.

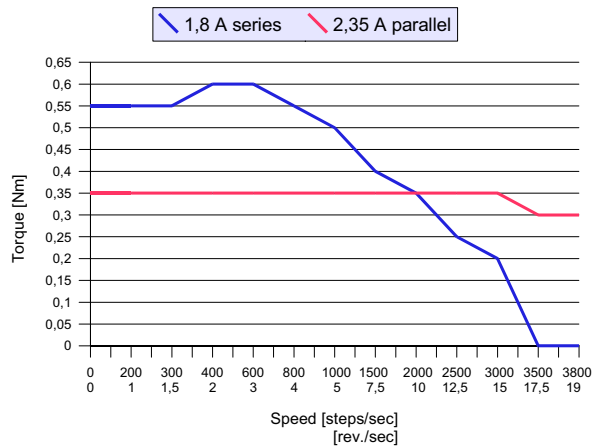
# TORQUE SPEED CHARACTERISTICS

## SM23, SM31, SM32 Series

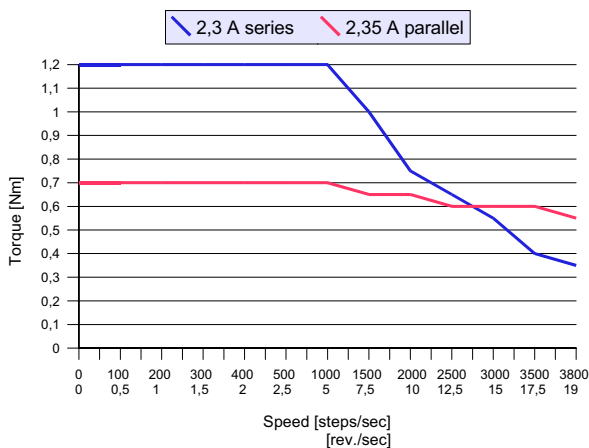
Torque/speed curves of SM2317-0800 stepper motor with CD20M board for 35 VDC



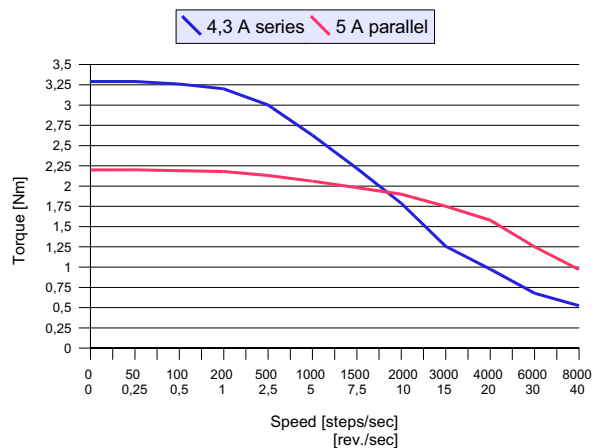
Torque/speed curves of SM2317-0800 stepper motor with CD30M board for 48 VDC



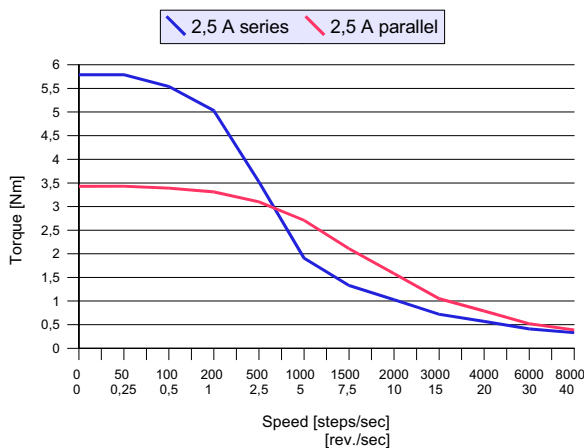
Torque/speed curves of SM2321-1400 stepper motor with CD30M board for 48 VDC



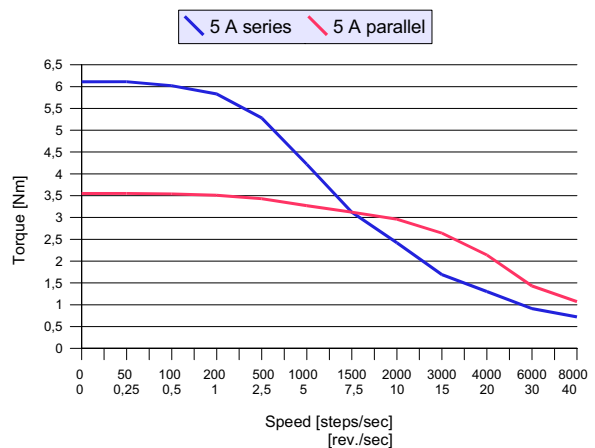
Torque/speed curves of SM31-4304 stepper motor with CD6410M module for 65 VDC



Torque/speed curves of SM32-2508 stepper motor with CD34M module for 48 VDC



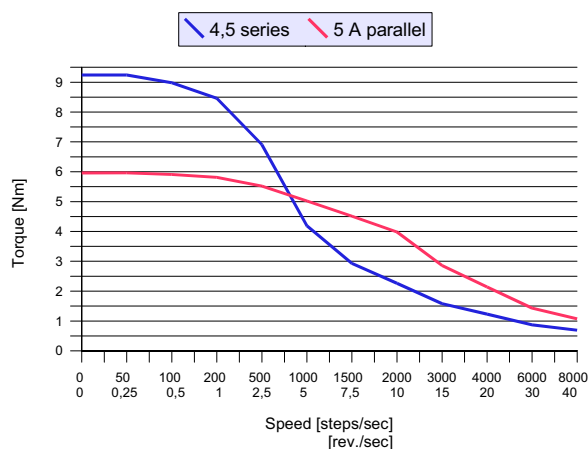
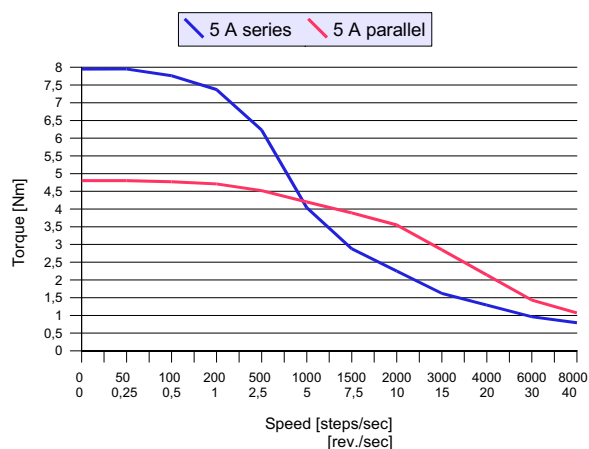
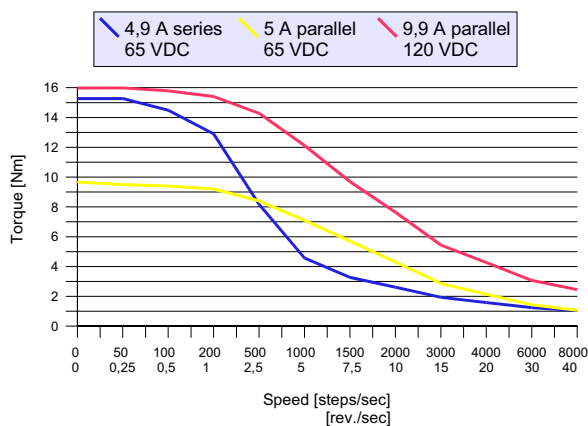
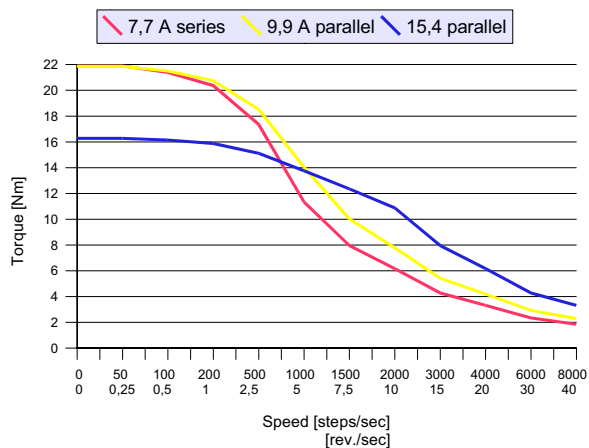
Torque/speed curves of SM32-5008 stepper motor with CD6410M module for 65 VDC



Motor current [A rms] / phase is included in the legends.

## TORQUE SPEED CHARACTERISTICS

## SM33, SM41, SM42, SM43 Series

Torque/speed curves of SM33-4513 stepper motor  
with CD6410M module for 65 VDCTorque/speed curves of SM41-5311 stepper motor  
with CD6410M module for 65 VDCTorque/speed curves of SM42-4922 stepper motor  
with CD6410M module for 65 VDC and  
with CDZMP-Mini module for 120 VDCTorque/speed curves of SM43-7730 stepper motor  
(SM43-4930 for 9,9 A) with CDZMP-Mini module for 120 VDC

Motor current [A rms] / phase is included in the legends.

## VOLTAGE CHANGES VS. PERFORMANCE

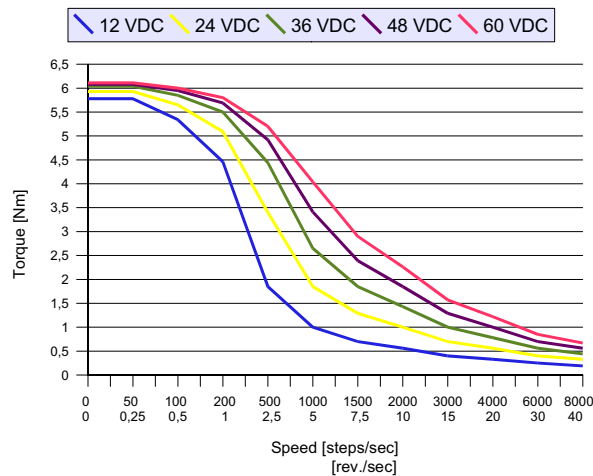
Low speed performance is not appreciably affected by supply voltage. One step time is sufficient for full motor winding inductance charging for high as well as low supply voltage. For this reason torque/speed curves do not decrease considerably at the low speed range. The high speed range begins at the point where the motor torque curve starts to decrease. Motor torque reduction is approximately proportional to supply voltage reduction.

Supply voltage decrease, however, results in speed and motor torque reduction, for example values change on a half approx. when 24 VDC is used instead of 48 VDC.

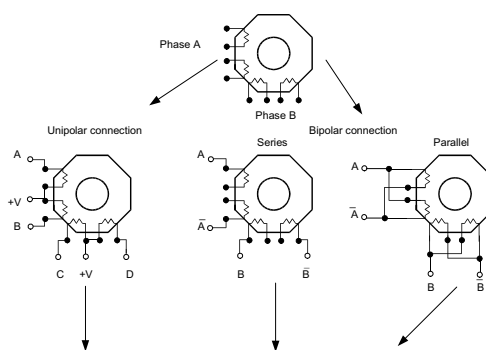
Higher voltages result in increased motor heating regardless of motor speed. Maximal motor winding temperature 130 °C must not be exceeded. As the motor winding temperature measurement is difficult, the motor outer surface temperature can be used also.

Auxiliary cooling is not necessary if the motor operates without forced air cooling and the motor outer surface temperature does not exceed 60 °C.

Torque/speed curves of SM32-5008 stepper motor  
(serial connection, drive setting 5 A per phase)



## PHASE SEQUENCING



		Unipolar Full Step Phase Sequencing				Bipolar Full Step Phase Sequencing				0 = OFF or open + = positive current flow - = negative current flow
CW	Step	A	B	C	D	A	$\bar{A}$	B	$\bar{B}$	
	1	GND	0	GND	0	+	-	-	+	
	2	0	GND	GND	0	-	+	-	+	
	3	0	GND	0	GND	-	+	+	-	
	4	GND	0	0	GND	+	-	+	-	
CCW	1	GND	0	GND	0	+	-	-	+	

Due to better performance Microcon delivers bipolar drives only and all torque/speed curves are specified for bipolar drives.



## WORM GEAR REDUCERS

### WORM GEAR REDUCERS

Microcon is authorized distributor of worm gear reducers manufactured by TOS Znojmo. Sets with suitable stepper motor are also available.



**MRT Series**



**MRTK Series**

<b>RT Series</b>	<b>MRT Series</b>	<b>MRTK Series</b>
<b>General Description</b>		
Worm gear reducer with ingoing shaft end and without a motor mounting flange.	Worm gear reducer with hollow ingoing shaft end in combination with a motor mounting flange.	Worm gear reducer with ingoing shaft end in combination with a motor mounting flange.
<b>Where to Use</b>		
Worm gear reducers are recommended for very low speed rotary motion applications (up to 2 rev./sec). The worm gear reducers can be used also to achieve high resolution or to avoid reversibility at higher gear ratios. Stepper motor systems provide very high torque at the low speed range. Consequently worm gear reducers are not necessary for the majority of linear applications. Their using is advantageous for most rotary applications.		
	The direct interconnection MRT Series / stepper motor is recommended in applications with 6410-001, CD6410M modules (patented digital electronic damping reduces instability at speeds in middle of operating range).	The interconnection MRTK Series with stepper motor using Oldham flexible coupler (assembly with screws going through spacers) provides smooth operation with standard microstepping stepper drives.
<b>Max. Output Torque (Nm) [Frame Size]</b>		
<b>18 [28], 44 [40], 81 [50], 142 [60], 182 [70], 298 [80], 580 [100], 850 [120], 1 520 [150], 2 387 [180]</b>		
<b>Gear Ratio</b>		
7,5:1; 10:1; 12,5:1; 15:1; 20:1; 25:1; 30:1; 40:1; 50:1; 60:1; 80:1; 100:1 (100:1 gear ratio is not available for frame size 28)		
<b>Efficiency</b>		
up to 93%		

The TOS Znojmo product catalogue is available for further details. Stock items according to the table on the following page.

## WORM GEAR REDUCERS

The worm gear reducers can be supplied completed with stepper motors. The interconnection MRTK Reducer Series with stepper motor uses Oldham flexible coupler and spacers. The direct interconnection MRT Reducer Series with stepper motor is recommended in applications with 6410-001 and CD6410M modules with patented digital electronic damping reducing instability in middle speed ranges.

Model	Suitable stepper motors	Model	Suitable stepper motors
<b>MRTK-28-10-A/B3-56/65</b>	SM2321-1400, SM2321-1800	<b>MRTK-50-30-A/B3-71/100</b>	SL34-3550, SM31 Series
<b>MRTK-28-30-A/B3-56/65</b>	SL23-1012 (2812), SM2317-0800	<b>MRTK-50-60-A/B3-71/100</b>	SL34-2530
<b>MRTK-28-60-A/B3-56/65</b>	SL23-0704	<b>MRTK-70-10-A/B3-80/130</b>	SM42 Series
<b>MRTK-40-10-A/B3-71/100</b>	SL34-3550, SM31 Series	<b>MRTK-70-30-A/B3-80/130</b>	SM41 Series
<b>MRTK-40-20-A/B3-71/100</b>	SL34-2530	<b>MRT-70-10-A/B3-80/130</b>	SM42 Series + 6410-001, CD6410M
<b>MRTK-50-10-A/B3-71/100</b>	SM32, SM33 Series	<b>MRT-70-30-A/B3-80/130</b>	SM41 Series + 6410-001, CD6410M

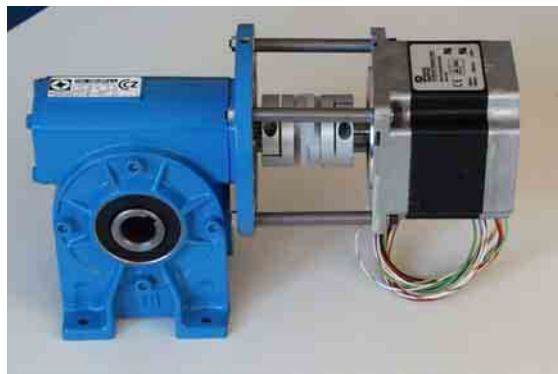
**Ordering example: MRTK-28-10-A/B3-56/65**

**MRTK-28** series and frame size  
**10** gear ratio 10:1  
**A/B3** version / mounting (standard - see pictures below)  
**56/65** motor frame size / pitch circle diameter of frame holes

Additional worm gear reducer models (other gear ratio, frame sizes or versions, etc.) - see the TOS Znojmo worm gear reducers catalogue.



**MRTK28 / SM2317-0800**  
**10 Nm**




**MRTK40 / SM31-4304S**  
**27 Nm**

## FLEXIBLE COUPLERS

## HUCO FLEXIBLE COUPLERS

Flexible couplers can tolerate misalignments and axial motion and protect the shaft support bearings from destructive radial and thrust loads.

<b>OLDHAM</b> Sliding disc type	<b>MULTI-BEAM</b> Multi-helix beam type	<b>FLEX-B</b> Bellows type	<b>FLEX-M</b> Membrane type
			
General Description			
General purpose, robust, easy to use 3-part couplers with replaceable wear elements (2 hubs and 1 torque disc). This type can tolerate large misalignments with flex-free mechanical action featuring non-progressive bearing loads. Isolates noise and vibration, especially with nylon disc.	Multi-Beam couplers provide misalignment compensation and axial compliance. This type offers the high torque with small dimensions.	Precision couplers with excellent kinematic properties. The 3 types (short, long and stretched types) offer differing combination of stiffness, radial compensation and axial motion. They are suitable for high speed applications.	Precision couplers with excellent kinematic properties. Dynamically balanced construction and the tolerant flexural system for highly dynamic position and velocity control systems.
Where to Use			
The best choice for stepper motor systems; the other applications involving speeds up to 3 000 rpm.	Suitable for applications with place deficiency and axial stiffness requirement.	Highly dynamic applications and velocity control systems (servo drives, etc.).	
Speeds (in standard form)			
up to 3 000 rpm	up to 5 000 rpm	up to 5 000 rpm	up to 5 000 rpm
Peak Torque Largest Size			
44 Nm	140 Nm	12,5 Nm	60 Nm
Standard Bores			
2 - 30 mm	2 - 38 mm	3 - 20 mm	3 - 28 mm
ADDITIONAL FLEXIBLE COUPLER TYPES			
<b>UNI-LAT (Universal / lateral type)</b> - general purpose light duty couplers with generous angular and radial misalignment compensation, resistance to axial motion			
<b>HUCO-POL (Universal joint &amp; telescopes)</b> - light duty plastic universal joints and extensible drive shafts (telescopes)			
<b>VARI-TORK (Friction clutches)</b> - small, user-adjustable torque limiters for concentric or in-line mounting			

The popular Oldham flexible couplers for most stepper motor applications:





Description	S13 (2x232.13+disc)	XY19 (2x453H19+disc)	XY25 (2x452H25+disc)	XY41 (2x452H41+disc)	XY57 (2x452H57+disc)
Max. recommended stepper motor static torque for typical applications (Nm)	0,15	0,35	1,5	11	30
Outer diameter (mm) [length (mm)]	12,7 [15,9]	19,1 [26]	25,4 [32,4]	41,3 [50,8]	57,1 [78]

The Huco Engineering product catalogue is available for further details. See the effective price list for stock items.

## LINEAR MOTION PRODUCTS

### KERK LEAD SCREW ASSEMBLIES

TFE coated lead screw and self-lubricating polyacetal nut

Lead screws - anti-backlash and standard assemblies with high efficiency			
<b>General Description</b> <ul style="list-style-type: none"> <li>- 303 stainless steel</li> <li>- TFE coated screw length up to 2,4 m (supplied cut-to-length) - TFE coating (special formulation) for the maximum level of self-lubrication and for the nut life extension</li> <li>- Self-lubricating polyacetal nuts</li> <li>- Positional repeatability is within 0,0013 mm</li> <li>- Standard lead accuracy is better than 0,0006 mm/mm (lead accuracies to 0,0001 mm/mm are also available)</li> </ul>			
			
<b>B Series</b>	<b>ZBX Series</b>	<b>NTB Series</b>	<b>VHD Series</b>
General Description			
It provides effective power transmission at minimum cost and features long life.	Patented self-lubricating polyacetal nut; anti-backlash assembly offers precise positional accuracy and repeatability at a low cost.	Using Kerk's patented axial take-up mechanism, it maintains axial stiffness with minimum system drag torque, provides smooth operation and long life.	Assembly delivers maximum load carrying capability with the highest axial and radial stiffness, provides low drag torque by making use of the axial take-up mechanism.
Where To Use			
The B Series general purpose assembly is designed for applications not requiring anti-backlash and wear compensation.	The ZBX Series is appropriate for light load applications requiring noise or vibration control.	The NTB Series anti-backlash assembly is designed for higher load applications than the ZBX Series units; the best price/performance ratio.	The VHD Series is designed for smooth, quiet operation and long life; high-tech solution for heavy duty applications.
Screw Diameter			
6,35 - 23,81 mm	6,35 - 15,88 mm	6,35 - 23,81 mm	12,7 - 19,05 mm
Metric Lead			
1 - 50 mm/rev.	1 - 25 mm/rev.	1 - 50 mm/rev.	2,5 - 50 mm/rev.
Efficiency (5 mm lead and higher)			
51 - 84%	62 - 84%	51 - 84%	51 - 84%
Dynamic Design Load			
200 - 2 270 N	20 - 160 N	45 - 900 N	680 - 1 590 N
Anti-Backlash Life with TFE Coating (1/4 Design Load)			
Typical backlash 0,076- 0,25 mm	380 - 500 x 10 <sup>4</sup> m	500 - 635 x 10 <sup>4</sup> m	760 - 880 x 10 <sup>4</sup> m

#### LR Series Support Rails

- The linear rail system has been designed for light load applications where low cost, minimum frictional drag and long wear life are primary design considerations. The assembly consists of a special stainless steel shaft mated with a thermoplastic bushing.

#### Mini Lead Screw Assemblies

- The Mini Series includes anti-backlash and standard assemblies; revolutionary miniature designs for applications previously off limits to lead screw technology. The screw diameters from 3,18 mm.

The Kerk product catalogue is available for further details. See the effective price list for stock items.

## KERK SCREWRAILS

- suitable for light load applications

**ScrewRails - drive and support/guidance functions in a single, compact, coaxial component****General Description**

- ScrewRails length up to 1,2 m (TFE coated assemblies for maximum level of self-lubrication)
- Self-lubricating polyacetal nuts
- Positional repeatability is within 0,0013 mm
- Standard lead accuracy is better than 0,0006 mm/mm (lead accuracies to 0,0001 mm/mm are also available)

**SRQX Series****SRZ Series****General Description**

A standard nut with anti-backlash compensation. The flange with a hole is extended to accept an auxiliary rail for higher torsional loads.  
Backlash is compensated in axial motion direction.

A special nut with Kerk's patented axial take-up mechanism providing continuous self-adjusting anti-backlash compensation. The unit is capable of carrying axial loads in either direction with no backlash.

**Where To Use**

The SRQX Series is appropriate for general applications where higher torsional stiffness with minimal backlash is required.

The SRZ Series anti-backlash assembly is designed for smooth and quiet operation and long life.

**Screw Diameter**

6,35 - 12,7 mm

**Rail Diameter**

12,7 - 25,4 mm

**Metric Lead**

1 - 25 mm/rev.

**Efficiency (5 mm lead and higher)**

62 - 84%

**Dynamic Design Load**

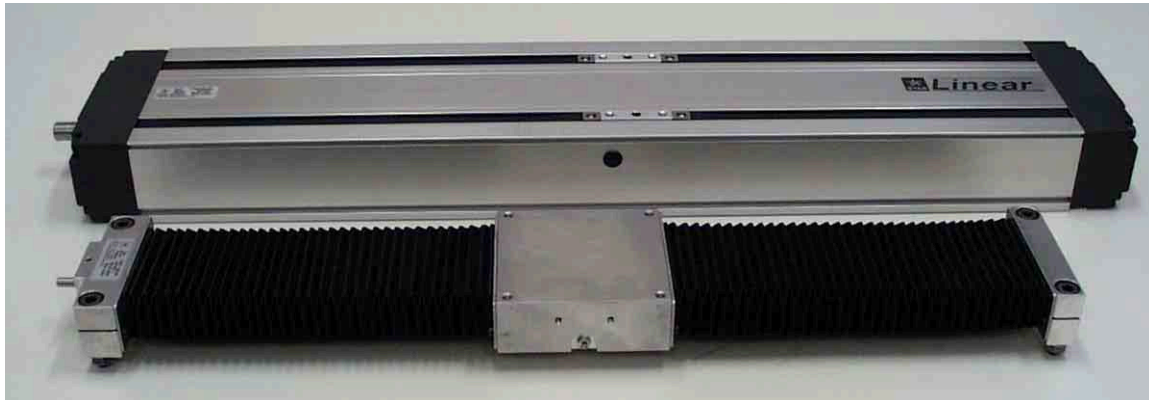
110 - 450 N

**Life at 1/4 Design Load**up to 200 x 10<sup>4</sup> mup to 410 x 10<sup>4</sup> m**End Supports**

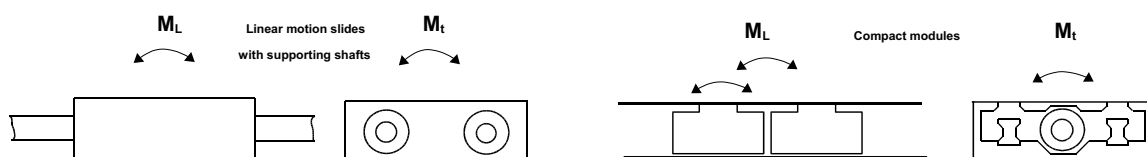
- for all ScrewRails optional; end supports are designed to be fixed over the outside diameter of each end of the rail
- suitable for easy and fast assembly mounting
- end supports with the flange fitting to the motor frame size:
  - NEMA 17 - screw diameter 6,35 mm
  - NEMA 23 - screw diameter 12,7 mm

The Kerk Motion Products product catalogue is available for further details. See the effective price list for stock items.

**BOSCH REXROTH LINEAR MOTION SLIDES**



<b>LB16 Series</b> <b>LB16N05-xxxx (SGO/SGK 16-100)</b> <b>LB16</b> - linear motion slide with $\varnothing$ 16 mm supporting shafts <b>N</b> - no cover, <b>C</b> - cover <b>05</b> - ball screw lead (mm), <b>00</b> - no drive unit <b>xxxx</b> - length (mm)	<b>CKK12 Series</b> <b>CKK12S05-xxxx (CKK 12-90)</b> <b>CKK12</b> - compact module with guideway width approx. 12 mm <b>S</b> - one carriage, <b>D</b> - two carriages <b>05</b> - ball screw lead (mm) <b>xxxx</b> - length (mm)	<b>CKK20 Series</b> <b>CKK20S05-xxxx (CKK 20-145)</b> <b>CKK20</b> - compact module with guideway width approx. 20 mm <b>S</b> - one carriage, <b>D</b> - two carriages <b>05</b> - ball screw lead (mm) <b>xxxx</b> - length (mm)
<b>General Description</b>		
Linear motion slides with supporting shafts provide high carrying capability. The motion systems with shaft diameter 16 mm are suitable for light and medium load applications and achieve good price/performance ratio.	Compact modules are ready-to-mount precision guide systems offering outstanding performance within a compact envelope, small dimensions, and excellent price/performance ratio. The compact module contains one or two carriages according to application load requirements.	
<b>Where To Use</b>		
Linear motion slides are designed to change rotary motion to linear load motion in positional applications. The ball screw leads choice determines linear motion force and velocity by using the same motor torque. The stepper motor/linear motion slide combination offers precise and cost effective linear motion system.		
<b>Ball Screw - Diameter x Lead</b>		
12 mm x 5 (10) mm/rev.	12 mm x 5 (10) mm/rev.	20 mm x 5 (20) mm/rev. 25 mm x 10 mm/rev.
<b>Max. Dynamic Design Load</b>		
3 050 N	7 500 N (2 carriages), 4 620 N (1 carriage)	61 080 N (2 carriages), 37 600 N (1 carr.)
As far as the desired service life concerned, loads of up to approximately 20% of the dynamic load and moment values have proved acceptable.		
<b>Dynamic Moments <math>M_L</math> (Nm) [<math>M_t</math> (Nm)]</b> (see pictures below)		
87 [82]	240 (2 carriages), 16 (1 carriage) [200 (2 carriages), 125 (1 carriage)]	3 050 (2 carriages), 255 (1 carriage) [2 685 (2 carriages), 1 650 (1 carriage)]
<b>Max. Length</b>		
1 500 mm	750 mm	1 800 mm



The Bosch Rexroth product catalogue is available for further details. See the effective price list for stock items.

## COMPLETE STEPPER MOTOR SETS

Complete stepper motor set includes programmable stepper indexer/drive board or module, stepper motor, Oldham flexible coupler, Inmotion PC Utilities software and serial cable. Technical documentation and mating connectors are attached to all sets.

### COMPLETE STEPPER MOTOR SETS EXAMPLES:

(recommended component combinations)

- **Inmotion PC Utilities software and serial cable** are attached to all sets

**SCD20M02:** CD20M board, **SX17-0502** stepper motor, S13 Oldham flexible coupler with bore diameters 5 mm for both shafts

**SCD20M04:** CD20M board, **SL23-0704** stepper motor, XY19 Oldham flexible coupler with bore diameters 6,35 mm (for motor shaft) and 6 mm

**SCD20M08:** CD20M board, **SM2317-0800** stepper motor, motor cabling - 8 lead, XY25 Oldham flexible coupler with bore diameters 6,35 mm (for motor shaft) and 8 mm

**SCD20M1:** CD20M board, **SL23-1012** stepper motor, XY25 Oldham flexible coupler with bore diameters 6,35 mm (for motor shaft) and 8 mm

**SCD30M2:** CD30M board, **SM2321-1400** stepper motor, motor cabling - 8 lead, XY25 Oldham flexible coupler with bore diameters 6,35 mm (for motor shaft) and 8 mm

**SCD30M3:** CD30M board, **SL34-2530** stepper motor, XY41 Oldham flexible coupler with bore diameters 9,525 mm (for motor shaft) and 10 mm

**SCD34M2:** CD34M module, **SM2321-1400** stepper motor, motor cabling - 8 lead, XY25 Oldham flexible coupler with bore diameters 6,35 mm (for motor shaft) and 8 mm

**SCD34M3:** CD34M module, **SL34-2530** stepper motor, XY41 Oldham flexible coupler with bore diameters 9,525 mm (for motor shaft) and 10 mm

**SCD34M8:** CD34M module, **SM32-2508S** stepper motor, XY41 Oldham flexible coupler with bore diameters 12,7R mm (for motor shaft) and 15 mm

**SCD40M5:** CD40M board, **SL34-3550** stepper motor, XY41 Oldham flexible coupler with bore diameters 9,525 mm (for motor shaft) and 10 mm

**SCD64M8:** CD6410M module with accessories, **SM32-5008S** stepper motor, XY41 Oldham flexible coupler with bore diameters 12,7R mm (for motor shaft) and 15 mm

**SCD64M11:** CD6410M module with accessories, **SM41-5311** stepper motor, XY41 / XY57 Oldham flexible coupler with bore diameters 19,05R mm (for motor shaft) and 20 mm





## COMPLETE MOTION CONTROL SYSTEMS

### COMPLETE LINEAR STEPPER MOTOR SYSTEMS

Complete linear stepper motor system consists of programmable stepper indexer/drive board or module, stepper motor, coupling element with Oldham flexible coupler, Bosch Rexroth linear motion slide equipped with ball screw drive / Kerk ScrewRail. Inmotion PC Utilities software, serial cable, mating connectors and technical documentation are attached to all assemblies.

The Microcon wide product line enables to assemble complete systems according to application requirements.

Complete Linear Stepper Motor System Model	Components			
	Stepper Motor Model / Holding Torque	Indexer/Drive Unit / Peak Current ; Max. Supply Voltage	Oldham Flexible Coupler Type	Linear Motion Slide Series
LC16N3423	SM2321-1400 / 1,5 Nm	CD34M / 3,5 A; 48 V	XY25	LB16N05(10)-xxxx
LC12S3423	SM2321-1400 / 1,5 Nm	CD34M / 3,5 A; 48 V	XY25	CKK12S05(10)-xxxx
LC20S3434	SL34-2530 / 3 Nm	CD34M / 3,5 A; 48 V	XY41	CKK20S05(10, 20)-xxxx
LC20D6433	SM33-4513S / 13 Nm	CD6410M / 7 A; 75 V	XY41 / XY57	CKK20D05(10, 20)-xxxx
The complete linear stepper motor system with the ScrewRail for light load applications				
SRZ4-2017	SX17-0502 / 0,25 Nm	CD20M / 2 A; 35 V	XY19	SRZ3DU4M Series



LC20D6433 model



SRZ4-2017 model